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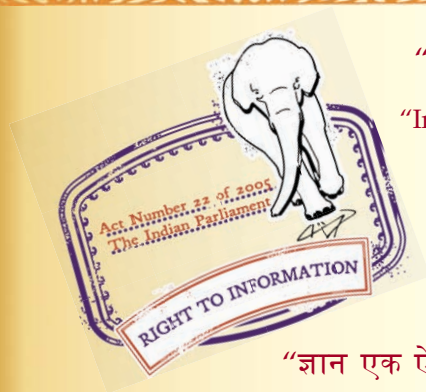
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IS 4086 (1983): Distributors for Spark Ignition Engines
[TED 11: Automotive Electrical Equipment]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

SPECIFICATION FOR

DISTRIBUTORS FOR SPARK IGNITION ENGINES

(*First Revision*)

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR DISTRIBUTORS FOR SPARK IGNITION ENGINES (*First Revision*)

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Indian Standard
SPECIFICATION FOR
DISTRIBUTORS FOR SPARK IGNITION ENGINES
(*First Revision*)

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 26 December 1983, after the draft finalized by the Automotive Electrical Equipment Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard was first issued in 1967. This revision has been undertaken to upgrade its contents and bring in line with international practice.

0.3 This standard covers the requirements and methods of tests for distributors for automotive application employing spark-ignition engine as the prime mover, with an electrical system having 6 V or 12 V dc supply.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard specifies the requirements and methods of tests for distributors for automotive applications using spark-ignition engine as the prime mover, with an electrical system having 6 V or 12 V dc supply.

1.2 The requirements and methods of tests for distributor caps and rotor arms are covered in IS : 5546-1981†.

*Rules for rounding off numerical values (*revised*).

†Specification for distributor caps and rotor arms for automobiles (*first revision*).

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Distributor — Any device which incorporates a timing mechanism, a spark advance mechanism and a spark distribution mechanism all of which have a proper angular interrelationship in themselves.

2.2 Contact Gap — The measured minimum gap between the contacts of contact breaker assembly when the heel is situated at the crest of the cam lobe.

2.3 Dwell Angle — The angle of rotation of distributor shaft measured in degree for the duration of which the contacts remain closed between the adjacent cam lobes.

2.4 Firing Angle Spacing — The angle measured in degrees between the adjacent break points of contacts.

2.5 Automatic Advance (Centrifugal Advance) — The automatic advance angle is the advance in timing of the spark measured in degrees between the spark at the initial set speed (the lowest speed at which there is no advance specified) and the spark at the speed at which the required advance is specified.

2.6 Vacuum Advance — The vacuum advance angle is the advance in timing of the spark measured in degrees between the spark obtained at the 'no vacuum' initial setting and the spark obtained at the specified vacuum. Vacuum advance is to be checked with the distributor revolving at a low speed when there is no automatic advance.

2.7 Type Tests — Tests carried out to prove conformity with the specification. These are intended to prove the general qualities and design of a given type of distributor.

2.8 Acceptance Tests — Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

2.9 Routine Tests — Tests carried out on each distributor to check requirements which are likely to vary during production.

3. DESIGN AND CONSTRUCTION

3.1 The materials used, and the design and workmanship in the construction of distributors shall be of such quality that will provide adequate protection, in the normal use, against mechanical and electrical failures and shall withstand the effects of changing weather conditions, water or excessive dampness, corrosion, dust, steam, oil, high temperature or any other influence to which they will be exposed under the conditions of their normal use.

4. MARKING

4.1 The distributor shall be marked with the following:

- a) Name or trade-mark of the manufacturer;
- b) Part number;
- c) Direction of rotation of the shaft;
- d) Month and year of manufacture; and
- e) Country of manufacture.

4.1.1 The capacitor inside the distributor shall be marked with the suitable code for identification.

4.2 The distributors may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

5. TESTS

5.0 Conditions for Tests

5.0.1 *General* — All routine tests shall be carried out with the distributor located in a suitable vertical housing and driven by a concentric driving member. The driving member shall be designed to drive the distributor shaft without imposing end loads on the shaft or side loads on the bearings. Shaft end float shall be restricted by a suitable collar fitted to the shaft.

Unless specified otherwise, the ambient temperature during the tests shall be 15 to 45°C.

5.0.2 *Drive* — The speed of the mechanical drive shall be capable of being varied between 40 to 5 000 rev/min. A rotating spark gap synchronised with the drive shall be fitted, together with a graduated scale.

5.0.3 *Instruments* — Equipment shall be provided with meters for the measurement of speed, voltage capacitance power factor and insulation resistance. For peak voltage readings, the type of meter used shall be specified by the manufacturer of the distributor.

5.0.4 Low Tension Supply — The supply shall be derived from batteries, and shall be maintained at 6.5 V for 6 volt systems and 12.5 V for 12 volt systems.

5.0.5 Ignition Coil — The ignition coil used for all tests shall be of the type specified by the manufacturer of the distributor for tests in accordance with this standard (*see* IS : 2325-1981*).

5.0.6 Stationary Spark Gaps — Adequate number of stationary spark gaps shall be provided. Each spark gap shall be dimensioned as given in IS : 1062-1963†. The earthed electrode shall be set to give a gap of 10 mm with its axis in line with that of the high tension electrode.

5.0.7 Rotary Spark Gap — A rotary spark gap set at 8 kV shall be provided for the visual detection of misfires at high distributor speeds. The spark gap shall be driven at a constant speed, preferably 500 rev/min.

5.0.8 Manometer — Manometer shall be capable of measuring vacuum 650 mm mercury depression.

5.0.9 Vacuum Source — A source capable of creating the required vacuum for the distributors shall be provided.

5.1 Classification of Tests

5.1.1 Type Tests — The following shall constitute type tests:

- a) Visual examination (*see* 5.2),
- b) Dimensional check (*see* 5.3),
- c) Test for contact gap or dwell angle or both (*see* 5.4),
- d) Test for firing angle spacing (*see* 5.5),
- e) Slow speed test (*see* 5.6),
- f) High speed test (*see* 5.7),
- g) Centrifugal advance test (*see* 5.8),
- h) Vacuum advance test (*see* 5.9),
- j) Insulation resistance test (*see* 5.10),
- k) Endurance test (*see* 5.11),
- m) Vibration test (*see* 5.12),
- n) Corrosion resistance test (*see* 5.13),
- p) Damp heat (cycling) test (*see* 5.14),

*Ignition coils for battery-coil ignition system for automobiles (*first revision*).

†Methods of test for sparking plugs (*revised*).

- q) Cold test (*see* 5.15),
- r) Dry heat test (*see* 5.16), and
- s) Mould growth test (*see* 5.17).

5.1.1.1 Criteria for approval — Nine samples shall be submitted for testing together with the relevant data. These shall be tested according to the test schedule given in Appendix A.

5.1.1.2 In case of failure in one or more type tests, the testing authority may call for fresh samples not exceeding twice the number of original samples and subject them to the test(s) in which failure occurred. If in repeat tests no failure occurs, the tests may be considered to have been satisfied.

5.1.2 Acceptance Tests — The following shall constitute acceptance tests:

- a) Visual examination (*see* 5.2),
- b) Dimensional check (*see* 5.3),
- c) Test for contact gap or dwell angle or both (*see* 5.4),
- d) Test for firing angle spacing (*see* 5.5),
- e) Slow speed test (*see* 5.6),
- f) High speed test (*see* 5.7),
- g) Centrifugal advance test (*see* 5.8),
- h) Vacuum advance test (*see* 5.9),
- j) Insulation resistance test (*see* 5.10),
- k) Vibration test (*see* 5.12).

5.1.2.1 The number of samples for acceptance tests shall be as agreed upon between the manufacturer and the purchaser. However, a recommended plan of sampling is given in Appendix B.

5.1.3 Routine Tests — The following shall constitute routine tests:

- a) Visual examination (*see* 5.2),
- b) Dimensional check (*see* 5.3),
- c) Test for contact gap or dwell period or both (*see* 5.4),
- d) Test for firing angle spacing (*see* 5.5),

- e) Slow speed test (*see* 5.6),
- f) High speed test (*see* 5.7),
- g) Centrifugal advance test (*see* 5.8),
- h) Vacuum advance test (*see* 5.9), and
- j) Insulation resistance test (*see* 5.10).

5.2 Visual Examination — The distributors shall be checked for general workmanship and finish. It shall be free from any defect that may affect the function of distributors.

5.3 Dimensional Check — The distributors shall be checked for dimensions against the relevant specification supplied by manufacturer.

5.4 Test for Contact Breaker Gap or Dwell Period or Both — The distributor manufacturer may specify either the contact breaker gap setting tolerance or the mean dwell period, or both. The measurements shall be taken in the following manner.

5.4.1 Contact Breaker Gap — An indicator gauge shall be attached rigidly to the distributor body with the moving member positioned centrally behind the moving contact. The moving member shall be so directed that it measures contact movement.

The distributor shaft shall be rotated without side loading at any speed not exceeding 6 rev/min and the contact gap measured. The contact gap shall be within the limits specified by the manufacturer.

5.4.2 Dwell Angle — A disc graduated in degrees shall be rigidly attached to the distributor body, with a pointer over the disc rigidly mounted on to the distributor shaft. A low wattage bulb of rated voltage shall be connected in series with the contact breaker across the battery supply.

The dwell angle shall be measured by manual rotation of the pointer at a uniform rate in the normal direction of rotation of distributor. The angle of rotation for which the series bulb is 'ON' shall be considered the dwell angle.

5.5 Test for Firing Angle Spacing — The test set-up shall be as specified in 5.4.2. The point of firing, that is, the contact separation would be indicated by the series bulb. The angle contained between such adjacent break points shall be the firing angle.

The firing angle spacing shall be such that it lies within $\pm 1^\circ$ of the nominal firing angle.

5.6 Slow Speed Test — The ignition coil and the distributor shall be provided with normal connections and each distributor plug shall be connected to a stationary three point spark gap. The distributor shall be run at 100 ± 5 rev/min for one minute, during which period there shall be no misfiring.

5.7 High Speed Test — With the connections as given in 5.6, and all the plug leads connected together to a rotary spark gap, the distributor shall be run at the speed specified by manufacturer as the maximum speed for that type for a duration of one minute. There shall be no misfiring.

5.8 Centrifugal Advance Test — The centrifugal advance characteristic shall be within the tolerances specified by the manufacturer of the distributor. Characteristic shall normally be specified with speed decreasing from maximum, the zero setting having previously been made at a speed below 100 rev/min.

5.9 Vacuum Advance Test — The vacuum advance characteristic shall be within the tolerances specified by the manufacturer of the distributor. The characteristics shall normally be specified at 100 rev/min distributor speed and with the applied vacuum steadily falling from maximum. The vacuum shall be measured by a manometer.

5.10 Insulation Resistance Test — The insulation resistance shall be measured between the low tension terminal of distributor and body, with the contact breaker contacts open and the capacitor isolated from the distributor, by the application of 500 V dc for one minute. The measured value of insulation resistance shall be not less than 20 Megohms.

5.11 Endurance Test

5.11.0 The purpose of this test is to assess the ability of the distributor to function normally under varying speed and vacuum conditions.

5.11.1 Equipment — The equipment is required to give the following speed cycle, with the distributor mounted vertically and coupled in the manner related to specific applications:

3 seconds at $250 + 50$ rev/min
— 0

Acceleration to $2\ 000 \pm 150$ rev/min in 2 seconds

4 seconds at $2\ 000 \pm 150$ rev/min

Deceleration to $250 + 50$ rev/min in 3 seconds
— 0

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In addition to the above speed cycling, for distributors with vacuum advance mechanism, a vacuum cycle shall also be simultaneously applied to the distributor at the rate of 30 cycles per minute.

Each cycle shall consist of linear application of vacuum of 500 mm of Hg from zero and removal of vacuum back to zero.

The equipment shall also have annular to 10 kV spark gaps.

5.11.2 Procedure

5.11.2.1 The ignition coil shall be of the type specified by the distributor manufacturer and shall be energised from a battery in accordance with the ignition coil used. The low tension supply to the ignition coil shall be maintained at 6.5 V for 6 volts systems and 12.5 V for 12 volt systems.

5.11.2.2 The cam faces shall be lubricated at intervals of 150 hours with recommended lubricant and in the manner specified by the distributor manufacturer.

5.11.2.3 The contact gap shall be checked after 50 hours and at each subsequent 150 hours. It shall be re-set to the limits specified by the manufacturer if the limits are exceeded by 0.1 mm.

5.11.2.4 The duration of the test shall be 500 hours.

5.11.3 Assessment of Results — At the end of the test, the distributor shall be functioning and shall meet the following conditions.

5.11.3.1 The contact wear shall not exceed 0.5 mm when measured across the contact pair.

5.11.3.2 The heel wear shall not exceed 0.65 mm when calculated as change in contact gap setting.

5.11.3.3 The centrifugal advance curve shall be within $\pm 1^\circ$ of the original curve for the unit under test.

5.11.3.4 The vacuum advance curve shall be within $\pm 1^\circ$ of the original curve for the unit under test.

5.12 Vibration Test — The test shall be conducted as specified in IS : 2106 (Part 16)-1971*. The distributor with mountings, after being rigidly mounted on to a suitable vibrating machine constructed to produce simple harmonic motion given in 5.12.1 and 5.12.2.

5.12.1 Vibration testing by sweeping shall be conducted according to 9.2.1 of IS : 2106 (Part 16)-1971* with the following severities:

*Specification for environmental tests for electronic and electrical equipment: Part 16 Vibration test.

Frequency range	10 - 250 Hz
Displacement amplitude (up to a frequency of 57 to 62 Hz)	0.75 mm
Acceleration amplitude (above a frequency of 57 to 62 Hz)	5 g
Total duration	3 hours

At the end of the vibration test the distributor shall be examined for any evidence of damage and shall meet the requirements of tests specified in **5.1.3**.

5.12.2 Endurance testing at resonant frequency, if exist, shall also be done according to **9.2.2** of IS : 2106 (Part 16)-1971* with the following severities:

Frequency range for resonance search	10 - 250 Hz
Displacement amplitude (up to a frequency of 57 to 62 Hz)	0.75 mm
Acceleration amplitude (above a frequency of 57 to 62 Hz)	5 g
Total duration	10 hours at each frequency

At the end of the test, the distributor shall be examined for any evidence of damage and shall meet the requirements specified in **5.1.3**.

5.13 Corrosion Resistance Test — The test shall be conducted as specified in Appendix A of IS : 10250-1982†.

5.13.1 After removal from the salt spray, that is, within 2 hours after draining and again when tested 24 hours later, the distributor shall pass the tests given in **5.1.3**. The appearance of the product should not prejudice assessment of result.

5.14 Damp Heat (Cycling) Test — The test shall be carried out according to IS : 9000 (Part 5)-1981‡. The number of conditioning cycles shall be 21.

*Specification for environmental tests for electronic and electrical equipment: Part 16 Vibration test.

†Specification for severities for environmental tests for automotive electrical equipment.

‡Basic environmental testing procedures for electronic and electrical items: Part 5 Damp heat (cyclic) test.

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5.14.1 After the test the distributor shall meet the requirements of tests given in **5.1.3**.

5.15 Cold Test — The test shall be conducted as specified in IS : 9000 (Part 2/Sec 4)-1977*. The distributor shall be exposed to low temperature of -10°C for 2 hours.

5.15.1 At the end of the test, while the distributor is still at the low temperature it shall meet the requirements of tests in **5.1.3**.

5.16 Dry Heat Test — The test shall be conducted as specified in IS : 9000 (Part 3/Sec 5)-1977†. The distributor shall be exposed to high temperature of 70°C for 16 hours.

5.16.1 At the end of the test while the distributor is still at the high temperature it shall meet the requirements of tests in **5.1.3**.

5.17 Mould Growth Test — The test shall be carried out according to IS : 9000 (Part 10)-1979‡. The period of exposure shall be 28 days. At the end of the specified period, the product shall show no sign of mould growth

*Basic environmental testing procedures for electronic and electrical items: Part 2 Cold test, Section 4 Cold test for heat dissipating items with gradual change of temperature.

†Basic environmental testing procedures for electronic and electrical items: Part 3 Dry heat test, Section 5 Dry heat test for heat dissipating items with gradual change of temperature.

‡Basic environmental testing procedures for electronic and electrical items: Part 10 Mould growth test.

APPENDIX A

(Clause 5.1.1.1)

TEST SEQUENCE FOR TYPE APPROVAL

CLAUSE No.	TEST	SEQUENCE								
		1	2	3	4	5	6	7	8	9
5.2	Visual examination	x	x	x	x	x	x	x	x	x
5.3	Dimensional check	x	x	x						
5.4	Test for contact gap or dwell angle or both	x	x	x	x	x	x	x	x	x
5.5	Test for firing angle spacing	x	x	x	x	x	x	x	x	x
5.6	Slow speed test	x	x	x	x	x	x	x	x	x
5.7	High speed test	x	x	x	x	x	x	x	x	x
5.8	Centrifugal advance test	x	x	x	x	x	x	x	x	x
5.9	Vacuum advance test	x	x	x	x	x	x	x	x	x
5.10	Insulation resistance test	x	x	x	x	x	x	x	x	x
5.11	Endurance test	x	x	x						
5.12	Vibration test				x					
5.13	Corrosion resistance test					x				
5.14	Damp heat cycling test						x			
5.15	Cold test							x		
5.16	Dry heat test								x	
5.17	Mould growth test									x

 xSample to be tested.

APPENDIX B

(Clause 5.1.2.1)

RECOMMENDED PLAN OF SAMPLING**B-1. LOT**

B-1.1 In a consignment, all the distributors of the same design, manufactured from the same material under similar conditions of production shall be grouped together to constitute a lot.

B-1.2 The number of distributors to be selected from each lot shall depend upon the size of the lot and shall be in accordance with col 1 and 2 of Table 1.

TABLE 1 SAMPLE SIZE AND ACCEPTANCE NUMBER

LOT SIZE	SAMPLE SIZE	ACCEPTANCE NUMBER
Up to 500	20	1
501 to 1 000	32	2
1 001 to 3 000	50	3
3 001 to 10 000	80	5
10 001 and above	125	7

B-1.2.1 The distributors shall be selected from the lot at random. In order to ensure the randomness of selection, procedure given in IS : 4905-1968* may be followed.

B-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

B-2.1 All the distributors selected at random in accordance with col 1 and 2 of Table 1 shall be subjected to all the acceptance tests except vibration test. A distributor failing to satisfy any of the acceptance tests shall be termed as defective. The lot shall be considered as conforming to the requirements of these acceptance tests if the number of defectives found in the sample is less than or equal to the corresponding acceptance number given in col 3 of Table 1, otherwise the lot shall be rejected without further testing.

B-2.2 The lot which has been found as conforming to the above acceptance tests shall further be tested for vibrations test. For the purpose the sample size shall be 3 for lots of size up to 1 000 and 5 otherwise. A lot shall be considered as conforming to the requirements of vibration test if no defective is found in the sample.

B-2.3 A lot shall be considered as conforming to the requirements of acceptance tests if **B-2.1** and **B-2.3** are satisfied.

*Methods for random sampling.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²

INDIAN STANDARDS INSTITUTION

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones : 26 60 21, 27 01 31

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